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Simulation of Filamentation in plasmas with transverse and axial flows*

D. E. Hinkel, C. H. Still, B. B. Afeyan, R. L. Berger, A. B. Langdon, E.A. Williams,
Lawrence Livermore National Laboratory, University of California
Livermore, CA 94550

We have constructed a three-dimensional code (F3D) with nonlinear hydrodynamics[1] to study filamentation instabilities driven by nonuniform laser beams. In previous work with linearized hydrodynamics, we have shown that both supersonic and subsonic transverse flow "steers" the laser beam in the direction of the flow[2]. In agreement with analytic estimates[3], we have also observed in 3D simulations that, in homogeneous, initially stationary plasma, the laser beam hotspots move in time such that the time averaged laser intensity is smoother than the instantaneous pattern. This naturally ocurring smoothing is compared to the smoothing obtained with imposed schemes such as SSD. The addition of axial flow has been shown to have dramatic effects on the filamentation process in 2D simulations[4]. The influence of three dimensional beam structure on filamentation and beam smoothing will be examined with and without axial flow

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2 D. E. Hinkel, et al., submitted to PRL, Jan 1996
3 D. E. Hinkel and E. A. Williams, BAPS **37**, 1376, November 1992
4 A. Schmitt and B. B. Afeyan, BAPS Louisville, Ky., Nov. 1995

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